US006982515B2

(12) **United States Patent**
Howell et al.

(10) **Patent No.: US 6,982,515 B2**
(45) **Date of Patent: Jan. 3, 2006**

(54) **DUAL POSITION LINEAR DISPLACEMENT MICROMECHANISM**

(75) Inventors: **Larry Howell**, Orem, UT (US); **Scott Lyon**, Provo, UT (US); **Brent Weight**, Springville, UT (US); **Deanne Clements**, Lafayette, IN (US)

(73) Assignee: **Brigham Young University**, Provo, UT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 120 days.

(21) Appl. No.: **10/363,243**

(22) PCT Filed: **Sep. 12, 2001**

(86) PCT No.: **PCT/US01/28614**

§ 371 (c)(1),
(2), (4) Date: **Mar. 5, 2003**

(87) PCT Pub. No.: **WO02/23606**

PCT Pub. Date: **Mar. 21, 2002**

(65) **Prior Publication Data**

US 2005/0073380 A1 Apr. 7, 2005

(51) **Int. Cl.**
H02N 10/00 (2006.01)

(52) **U.S. Cl.** **310/307**

(58) **Field of Classification Search** ..... 310/40 MM, 310/306–309; 200/181, 600, 343, 339; 60/516, 60/527
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,179,499	A		1/1993	MacDonald et al.
5,355,562	A		10/1994	Matoba et al.
5,649,454	A		7/1997	Midha et al.
5,806,152	A		9/1998	Saitou et al.
5,867,302	A		2/1999	Fleming
5,998,906	A	*	12/1999	Jerman et al. 310/309
6,082,208	A	*	7/2000	Rodgers et al. 74/406
6,175,170	B1	*	1/2001	Kota et al. ..... 310/40 MM
6,215,081	B1	*	4/2001	Jensen et al. 200/341
6,303,885	B1	*	10/2001	Hichwa et al. 200/181
6,507,138	B1	*	1/2003	Rodgers et al. 310/309
6,675,578	B1	*	1/2004	Sinclair 60/528
2004/0227428	A1	*	11/2004	Sinclair 310/309

* cited by examiner

Primary Examiner—Tuyen T Nguyen
(74) *Attorney, Agent, or Firm*—Madson & Metcalf

(57) **ABSTRACT**

An apparatus **(1)** that is capable of a first stable configuration and a second stable configuration is disclosed. The bistable mechanism **(10)** has a leg **(30, 32)** that is coupled on one end by a base member **(22, 24)** and on the other end by a shuttle **(20)**. The leg **(30, 32)** stores potential energy as it is deflected. The potential energy stored in the leg **(30, 32)** has a maximum potential energy position with a low potential energy position on either side of the maximum. An apparatus and method are also disclosed for a latching mechanism **(910)** and the associated method. The latching mechanism **(910)** is comprised of a grasping member **(932)**, a lock slider **(928)**, and a detent slider **(916)**. These three members **(916, 928, 932)** operate together to induce a locked configuration and an unlocked configuration by actuating the lock slider **(928)** in a single direction.

33 Claims, 18 Drawing Sheets